

REMARKS

In the Office Action dated November 9, 2009, claims 1, 2, 5, 7-10, 12, 14-16, and 18-20 were presented for examination. Claims 1, 2, 5, and 18 were rejected under 35 U.S.C. §101, and claims 19 and 20 were rejected under §112, first paragraph. Claims 1, 2, 7, 8, 12, and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Abello et al.*, “Massive Quasi-Clique Detection,” 2002, in view of *Natarajan et al.*, U.S. Patent Publication No. 2004/0151121. Claims 19 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all limitations of the base claim and any intervening claims.

I. Rejection under 35 U.S.C. §101

In the Office Action dated November 9, 2009, claims 1, 2, 5, and 18 were rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter.

Applicant has amended independent claim 1 to overcome the above rejection directed to claims 1, 2, 5, and 18. Claim 5 was canceled in the prior communication. As such, the rejection of claim 5 is moot. The amendments to claim 1 are aimed to tie the method steps to hardware elements, such as a processor and a memory. More specifically, a processor is in communication with memory containing information about vertices in a graph and an associated connectivity count of the vertices. Support for this amendment is found in paragraph 0014 of Applicant’s publication. No new matter has been added with this amendment. It is Applicant’s position that the processor and memory, as hardware components, are physical and tangible elements and are considered statutory subject matter. Accordingly, Applicant respectfully requests that the Examiner remove the rejection set forth under 35 U.S.C. §101 and grant an allowance of claims 1, 2, and 18.

II. Rejection under 35 U.S.C. §112, first paragraph

In the Office Action dated November 9, 2009, the Examiner rejected claims 1, 7, 12, 19, and 20 under 35 U.S.C. §112, first paragraph. More specifically, the Examiner asserts that the

claims are omitting the essential step of determining which vertex to select when there are multiple vertices having the same least sum of connectivity counts. Applicant respectfully disagrees. Claim 1 includes a limitation pertaining to selection of a vertex with a least sum of connectivity counts of all neighboring vertices **from among all vertices with a least connectivity count**. As such, claim 1 addresses the situation when multiple vertices have the same least connectivity count. In this circumstance, the vertex to remove has to be selected from a plurality of vertices with the same least connectivity count. Accordingly, Applicant respectfully requests that the Examiner remove the rejection set forth under 35 U.S.C. §112, second paragraph, and grant an allowance of claim 1, 7, 12, 19 and 20.

III. Rejection under 35 U.S.C. §103(a)

In the Office Action dated November 9, 2009, claims 1, 2, 7, 8, 9, 12, 14, 15, and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Abello et al.*, “Massive Quasi-Clique Detection,” 2002, in view of *Natarajan et al.*, U.S. Patent Publication No. 2004/0151121.

Applicant’s remarks in relation to *Natarajan et al.* made in prior communications are hereby incorporated by reference.

Applicant has amended claim 1 to incorporate the limitations of claim 19 based upon the indication by the Examiner that claims 19 and 20 would be allowable if rewritten in independent form. Based upon the amendment to claim 1, it is Applicant’s position that claim 1 is now in condition for allowance. Accordingly, Applicant respectfully requests that the Examiner remove the rejection of claims 1, 2, and 18, and grant an allowance of these claims.

With respect to claims 7, 8, 9, 12, 14, and 15, the Examiner employs *Abello* as a primary prior art reference. *Abello et al.* (hereinafter referred to as *Abello*) teaches graph decomposition and pruning schemes including recursively deleting all edges incident with a vertex of degree (connectivity count) less than k , where k is a lower bound on the cardinality of maximum clique. The lower bound on the cardinality of maximum clique (k) is known. The edges incident to vertices of degree i are deleted in the order from $i=1$ to $k-1$ and the degree of both endpoints is

updated. Accordingly, *Abello* is based upon the provision of the lower bound on the cardinality of maximum clique.

In contrast, Applicant does not require knowing the lower bound on the cardinality of maximum clique. Applicant's claims are directed to removing vertices from a graph according to their connectivity counts, starting from a vertex with a least sum of connectivity counts of all neighboring vertices when a plurality of vertices in the graph has the same least connectivity count. *Abello* does not teach the limitation above. The fact that the pruning process of *Abello* starts with a vertex of the lowest degree (connectivity) does not address the situation when multiple vertices with the same lowest degree (connectivity) are present in the graph.

Furthermore, *Abello* does not teach removing vertices from the graph whereas Applicant's claims are directed to this specific limitation. *Abello* pertains to removing edges incident with a vertex of degree less than k . The vertex in a graph is not the same, or substitutable for the edge. In fact, a graph vertex and a graph edge represent two different and distinct elements. Accordingly, it is Applicant's position that *Abello* does not teach removing vertices from a graph in the manner claimed by Applicant.

Moreover, if the actual cardinality of the maximum clique is greater than k , the graph obtained upon completion of the pruning operation, as taught by *Abello*, will not be a clique. *Abello* does not teach continuing the pruning operation in a graph until remaining vertices and edges form a clique. In contrast, Applicant claims removing vertices from a graph until the remaining vertices and edges form a clique. The Examiner cited pages 602 and 603 of *Abello* in relation to returning a group of interconnected vertices forming a clique, wherein each vertex in said grouping is connected to each other vertex in said grouping. *Abello* teaches an algorithm for finding a maximum quasi-clique in a graph. The algorithm starts by selecting a random clique in the graph and recursively adding vertices to this initially selected clique such that the process will eventually terminate with a maximal clique. A new vertex is added to an already existing clique only if it is determined that the graph obtained as result of adding this new vertex will constitute a clique. Applicant's claims are directed to finding a clique in a graph by eliminating vertices

from the graph, not by adding them to a selected clique as taught by *Abello*. In other words, *Abello* is directed to the inverse of Applicant's claims.¹ According to Applicant's invention, each time a vertex is **removed** from a graph, a check is conducted whether remaining vertices in the graph form a clique. In contrast, *Abello* teaches creating a new graph by **adding** a vertex to an already existing clique based upon whether the created graph will form a new clique.

In addition, the combination of the pruning scheme, as discussed above, and the algorithm disclosed on pages 602 and 603 of *Abello* will result in checking whether the graph remaining after pruning is a clique or not. However, it is obvious, that if the actual cardinality of the maximum clique is greater than k, the graph obtained upon completion of the pruning operation will not be a clique. Accordingly, the combination of the pruning scheme and the algorithm for finding a maximum quasi-clique as suggested by the Examiner is NOT equivalent to the method claimed by Applicant.

If the prior art references do not teach or suggest every claim limitation of the Applicant's invention, then they do not meet every requirement under 35 U.S.C. §103(a) and are not sufficient to uphold a rejection under 35 U.S.C. §103(a).² In the present case, as stated above, Applicant claims a different algorithm than that taught in *Abello*. Accordingly, Applicant respectfully requests that the Examiner remove the rejection and direct allowance of claims 7, 8, 9, 12, 14, and 15.

IV. Conclusion

In view of the forgoing amendment and remarks to the claims, it is submitted that all of the claims remaining in the application are now in condition for allowance and such action is respectfully requested. Applicant is not conceding in this application that those claims in their prior forms are not patentable over the art cited by the Examiner, as the present claims are only for facilitating expeditious prosecution of the application. Applicant respectfully reserves the

¹ *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

² See MPEP §2143.

right to pursue these and other claims in one or more continuation and/or divisional patent applications. Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application, the undersigned respectfully requests that she be contacted at the number indicated below.

For the reasons outlined above, an allowance of this application is respectfully requested.

Respectfully submitted,
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